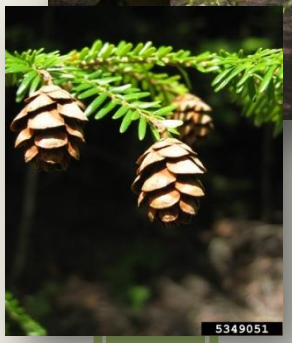
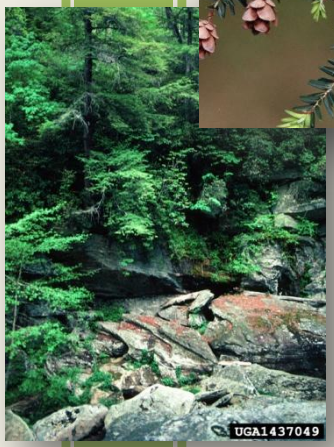




Eastern hemlock

Tsuga canadensis

Hemlock is a very slow-growing, shade tolerant species which was much more prevalent before the Cutover at the turn of the century. However, **hemlock volume is recovering** with an increase of 55% since 1983.

In the last two decades, g**rowth rates have increased** and mortality has remained unchanged, though much lower than other species. Hemlock accounts for about 2% of all volume and 1.3% growth of trees in Wisconsin, but less than 1% of total mortality.

Hemlock is not an important timber species, accounting for less than 1% of all roundwood. The low volume of hemlock and relative low wood density, may

- *How has the hemlock resource changed?*
  Growing stock volume and diameter class distribution: 1983, 1996, and 2008
- *Where does hemlock grow in Wisconsin?*
  Growing stock volume by region with map
- *How fast is hemlock growing?*
  Average annual net growth by region and year: 1983, 1996, and 2008
- *How healthy is hemlock in Wisconsin?*
  Average annual mortality: 1983, 1996, and 2008
- *How much hemlock do we harvest?*
  Roundwood production by product: 1997, 2003, and 2006
- *How much is hemlock selling for?*
  Prices for cordwood and sawtimber: 2000 to present
- *How much hemlock biomass do we have?*
  Oven-dry tons by region of the state: 2008

"How has the hemlock resource changed?"

Growing stock volume and diameter class distribution by year

The growing stock volume of hemlock in Wisconsin was about 441 million cft or 2.1% of total volume (Chart 1). This is an increase of 55% since 1983. Volume has remained statistically unchanged since 1996.

The hemlock resource has matured since 1996 with more volume in the largest size classes (Chart 2). For instance, the volume in small trees (5 to 13 inches) has decreased 12% since 1996 and the volume in large trees (over 13 inches) has increased 20%. One quarter of hemlock volume is in trees over 21 inches in diameter.

The number of sapling and sawtimber trees has decreased while the number of seedlings has increased by almost 60% (Chart 3).

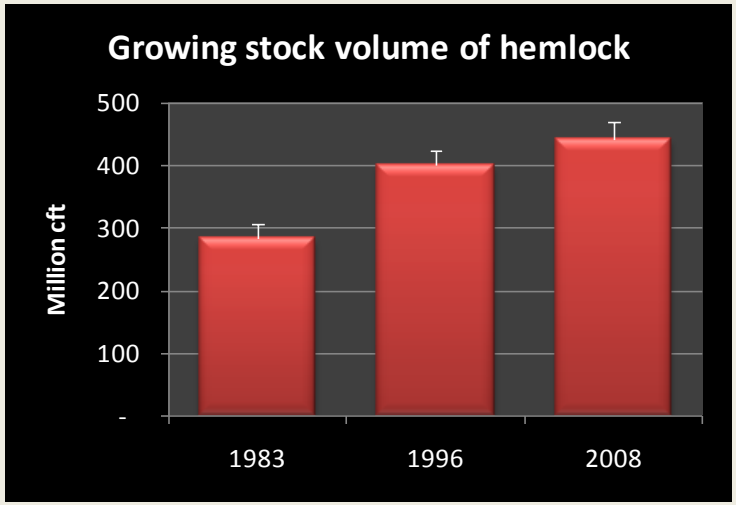


Chart 1. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

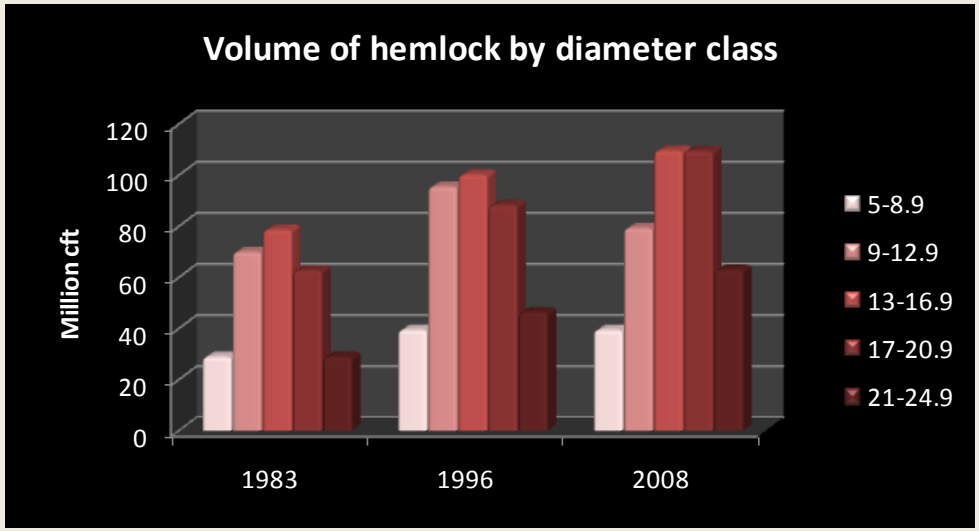


Chart 2. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

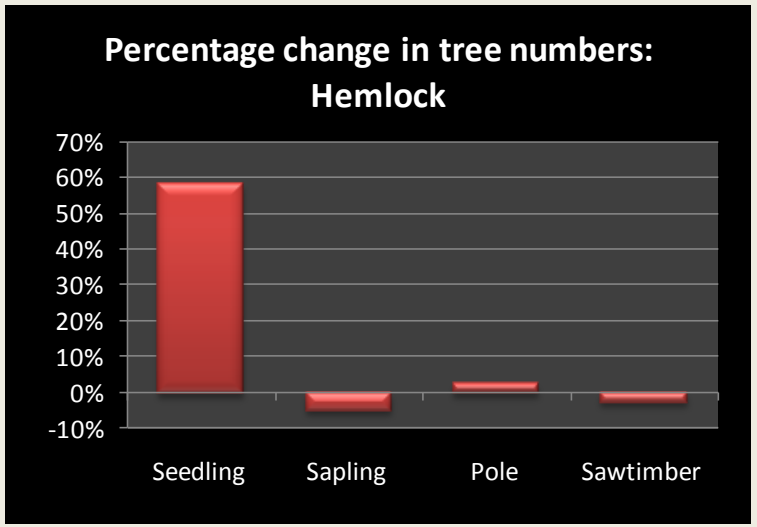
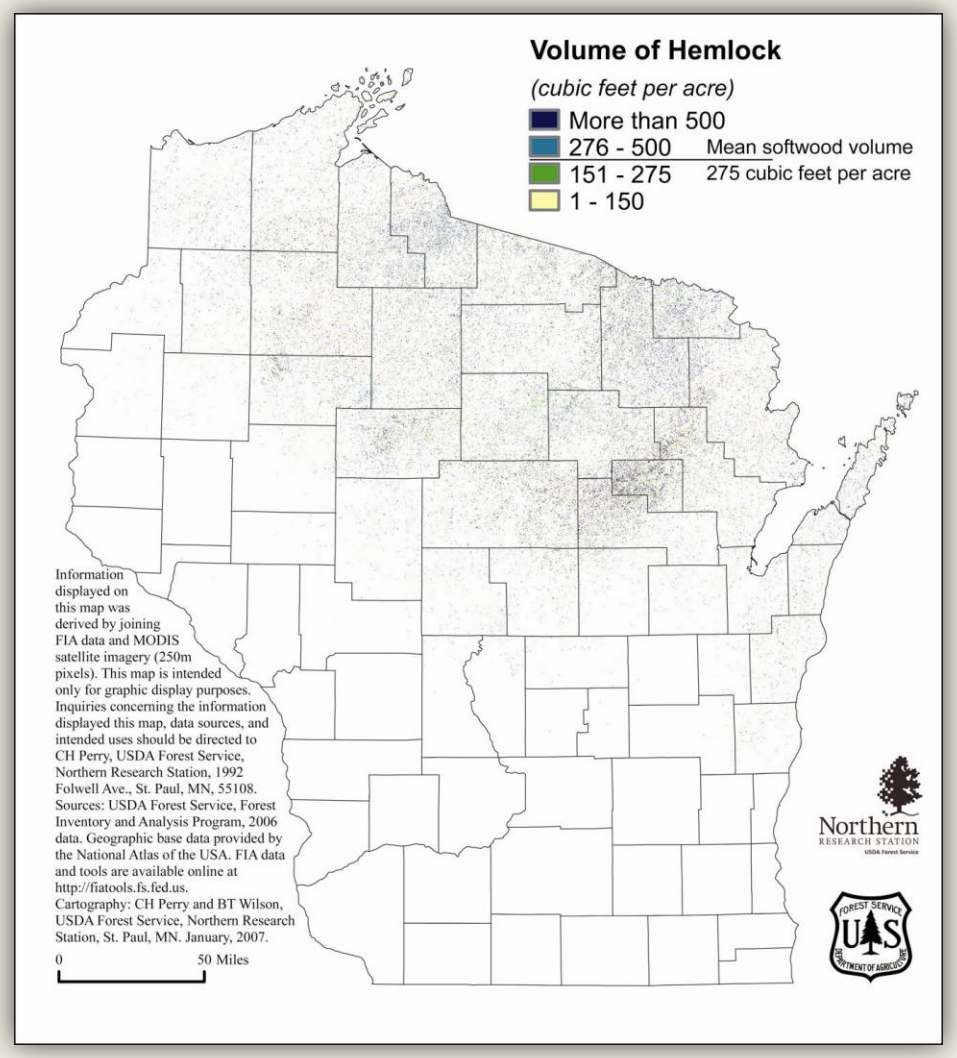


Chart 3. Percentage change in the number of live trees by size class between 1996 and 2008.
Source: USDA Forest Inventory and Analysis data 1996, and 2008.

"Where does hemlock grow in Wisconsin?"

Growing stock volume by region with map



About 89% of hemlock volume is located in northern Wisconsin, mainly in the northeast region (Table 1). It is found mainly in the maple-basswood forest type and to a lesser extent, on the white and red pine type.

Table 1. Growing stock volume (million cft) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total
Eastern hemlock	31	256	137	17	-	**441**
Percent of total	**7%**	**58%**	**31%**	**4%**	**0%**	**100%**

Source: USDA Forest Service, Forest Inventory and Analysis 2008 data

Additional tables: Volume by county in 2008 (pdf; Excel)

"How fast is hemlock growing?"

Average annual net growth by region and year

Average annual net growth of hemlock has more than doubled since 1983 to about 7.6 million cft/year (Chart 4). This represents about 1.3% of total volume growth in the state. Growth rates have remained statistically unchanged since 1996.

Although northern Wisconsin has the highest percentage of volume growth in hemlock, 76%, the ratio of growth to volume is lowest in this part of the state (Table 2).

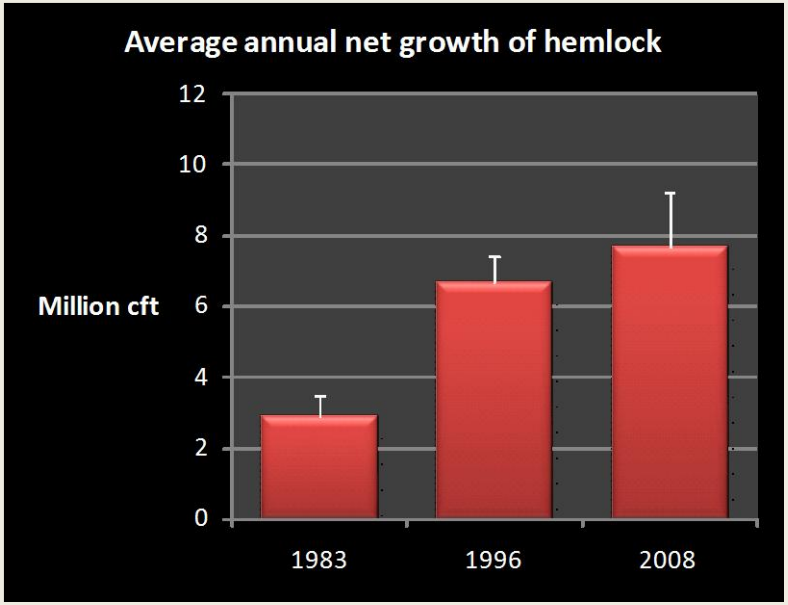


Chart 4. Average annual net growth (million cubic feet).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008

Table 2. Average annual net growth (million cft/year) of growing stock and the ratio of growth to volume by region of the state.

Region	Net growth	Percent of Total	Ratio of growth to volume
Central	1.2	15%	**3.8%**
Northeast	4.6	61%	**1.8%**
Northwest	1.2	16%	**0.9%**
Southeast	0.6	8%	**3.4%**
Southwest	0.0	0%	**.**
Statewide	**7.6**	**100%**	**1.7%**

Source: USDA Forest Inventory & Analysis data: 2008

The average statewide ratio for hemlock is 1.7%, much lower than the statewide average of 2.8% for all species. Hemlock is a very shade tolerant, slow-growing species.

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How healthy is hemlock in Wisconsin?"

Average annual mortality: 1983, 1996, and 2008

Average annual mortality of hemlock, about 2.1 million cft per year, has remained statistically unchanged for the last two decades.

The ratio of mortality to gross growth is 21% for hemlock, **lower than the statewide average** of 26% (Table 3). Whereas hemlock accounts for 2% of total growing stock volume in the state, it makes up only 1% of total mortality.

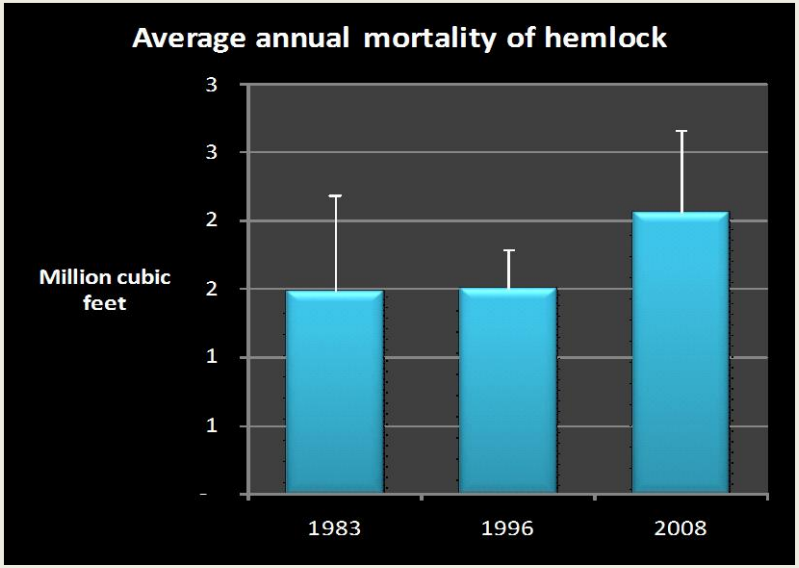


Chart 5. Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008

Table 3. Mortality, gross growth and the ratio of mortality to gross growth.

Species	Average annual mortality (cft)	Average annual gross growth (cft)	Mortality / growth
Eastern Hemlock	2,049,596	9,679,600	**21%**

Source: USDA Forest Inventory & Analysis data: 2008

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How much hemlock do we harvest?"

Roundwood production by product and year

In 2003, hemlock produced 3 million cft or less than 1% of Wisconsin's total roundwood production (Chart 6), ¾ was used for pulpwood and ¼ for sawlogs.

Between 2003 and 2006, pulpwood production had decreased by 1.4 million cft or 50%.

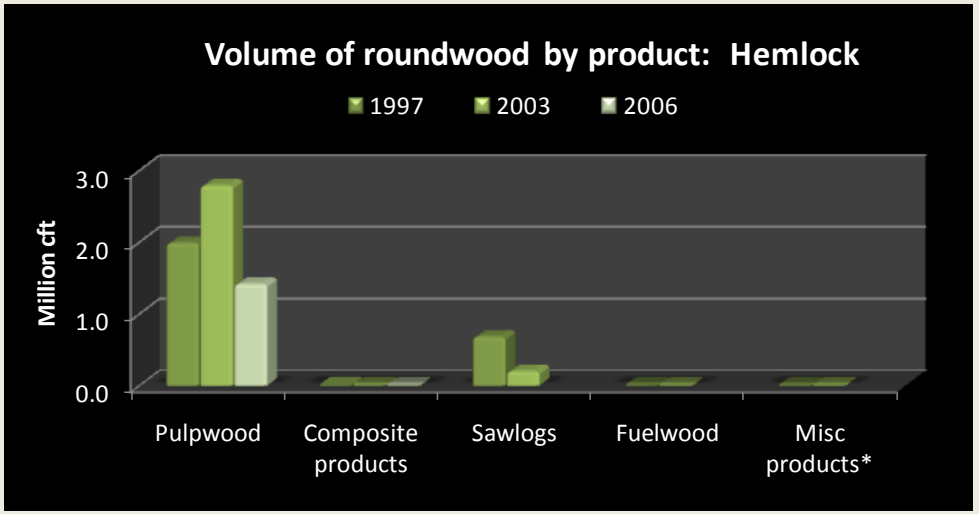


Chart 6. Volume of roundwood products. The most recent numbers for pulpwood and composite products are from 2006 and the most recent numbers for sawlogs, fuelwood and miscellaneous products are from 2003 (Ron Piva).
* Miscellaneous products include poles, posts, pilings and veneer.
Source: Timber Products Output Mapmaker, http://ncrs2.fs.fed.us/4801/fiadb/rpa_tpo/wc_rpa_tpo.ASP

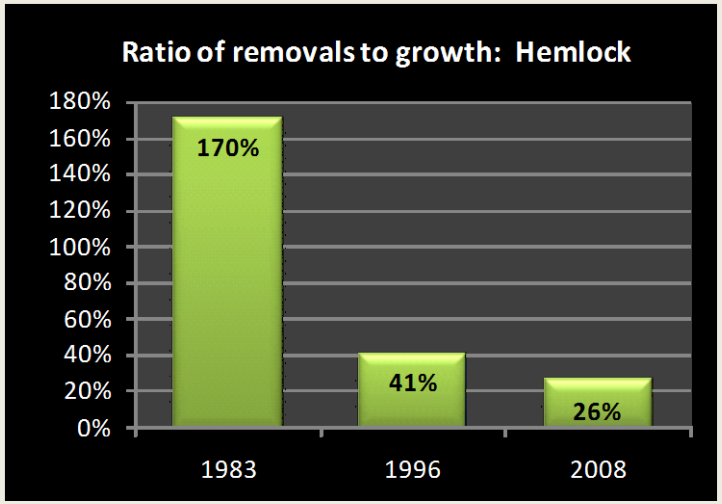


Chart 7. Ratio of volume harvested annually to net growth.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2008.

The ratio of removals to growth has decreased significantly since 1983 and now stands at 26%, much lower than the average of 56% for all species in the state (Chart 7). This is not due so much to decreased harvest as it is to increases in growth rates. Net growth rates for hemlock have more than tripled since 1983.

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How much is hemlock selling for?"

Prices for cordwood and sawtimber: 2000 to present

Since timber prices vary considerably from region to region, the prices reported here are weighted average stumpage prices from Wisconsin Administrative Code Chapter NR46 (chart 8).

Stumpage prices for both logs and cordwood peaked in 2006-2007 and have fallen considerably since (Table 4). They are both currently far below average for softwood prices in the state.

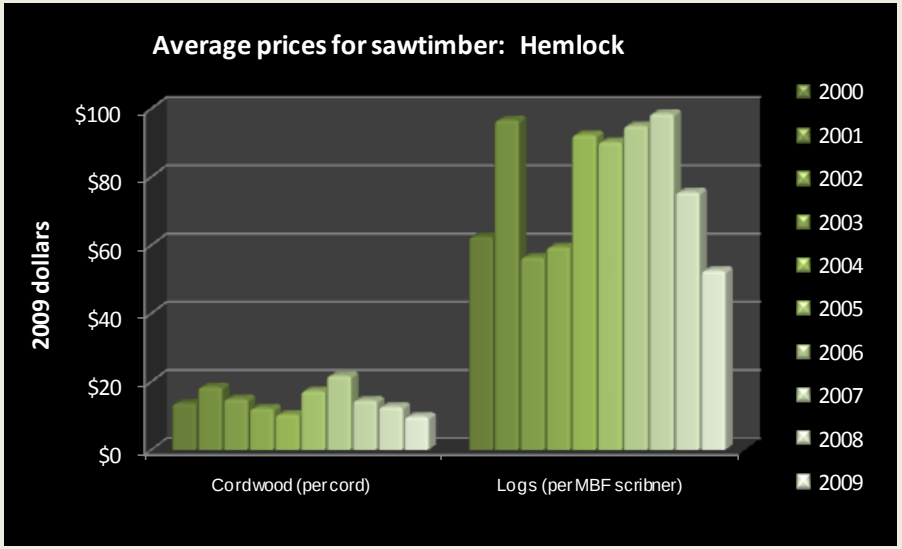


Chart 8. Average prices for cordwood and sawtimber (2007).
Source: Wisconsin Administrative Code Chapter NR46, 2000 to 2009

Table 4. Average weighted stumpage prices (adjusted for inflation to 2009 dollars) by year for Wisconsin.

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average for all softwoods
Cordwood (per cord)	$14	$18	$15	$12	$10	$17	$22	$15	$13	**$10**	$23
Logs (per MBF)	$63	$97	$57	$59	$92	$90	$95	$99	$76	**$53**	$76

Source: Wisconsin Administrative Code Chapter NR46, 2000 to 2009

"How much hemlock biomass do we have?"

Oven-dry tons by region of the state

There were 8.8 million oven-dry tons (ODT) of hemlock biomass in 2008, a decrease of 0.5 million ODT or 5.4%, from 1996. This species represents only 1.5% of all live biomass statewide. As with volume, most hemlock is located in northeast Wisconsin (Chart 9).

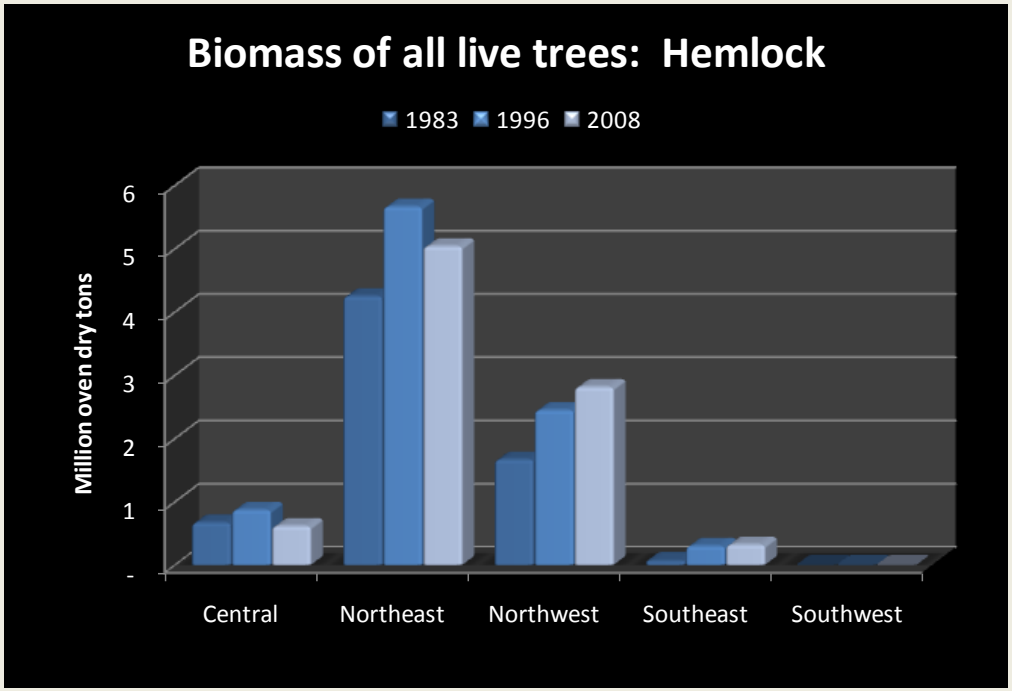


Chart 9. Biomass (million oven-dry tons) by year and region.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2008

Hemlock has a fairly low wood density but higher than other softwood species, with a ratio of biomass to volume of 37 oven-dry lbs. per cubic foot (ODT/cft). The average for all softwoods is about 34.3 ODP/cft and for all species is 46.8 ODP/cft.

A very high proportion, 82%, of all hemlock biomass is located in the main stem with only 14% in branches.

Additional tables: Biomass by county in 2008 (pdf; Excel)